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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,122	07/12/2005	Jean-Michel Rouet	FR 030001	8397

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EXAMINER	
PAPPAS, PETER	

ART UNIT	PAPER NUMBER
2628	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,122	ROUET ET AL.	
	Examiner	Art Unit	
	Peter-Anthony Pappas	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 July 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. It is noted that the Examiner attempted to contact the Applicant on 11/7/07 to discuss the instant application. However, the Applicant could not be reached and a voicemail message was left requesting the Applicant to contact the Examiner.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claim 12 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035. Applicant is reminded that there must be adequate support if any changes are made to the respective claim language.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3, 6 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flórez-Valencia et al. (3D Graphical Models for Vascular-Stent Pose Simulation) in view of Hernández-Hoyos et al. (Computer-assisted Analysis of Three-Dimensional MR Angiograms) in view of Montagnat et al. (A Hybrid Framework for Surface Registration and Deformable Models) and further in view of Yim et al. (Vessel Surface Reconstruction With a Tubular Deformable Model).

6. In regard to claim 1 it is noted the respective claim language includes open-ended language (i.e., comprising) and therefore said claim is not considered limited to only the limitations disclosed.

Flórez-Valencia et al. teaches a method for creating a deformable tubular (cylindrical) mesh model for fitting a (centerline for a portion of a 3D vessel) 3D path (p. 2, ¶ 4; p. 3, ¶ 2; Figs. 2-4) composed of a set of (vertices) ordered points (p. 3, ¶ 2; p. 4, ¶ 3) automatically adapting the mesh radius based on the curvature of the 3D path and sample distance of the path points (distance between the respective vertices of said centerline) and a (given radius) predetermined input radius (p. 3, ¶ 3; p. 5, ¶ 3; p. 6, ¶ 1; Figs. 2-4).

It is noted that method taught by Flórez-Valencia et al. is reliant upon teachings disclosed in papers [7: Hernández-Hoyos et al. – p. 425, col. 1, ¶ 3; p. 425, col. 2, ¶ 3; pp. 427-428, § How Does it Work; p. 434, § Conclusions; Figs. 7-9], [8: Montagnat et al. – pp. 1043-1044, § 3.1; pp. 1044-1046, § 5] and [16: Yim et al. – p. 1414, col. 1, ¶ 2; p. 1416, col. 1, ¶ 3; p. 1419, col. 2, ¶ 3; Fig. 4] which are directly referenced by Flórez-Valencia et al. (p. 2, ¶ 3, 4; p. 3, ¶ 5). It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the respective teachings of said papers into the method taught by Flórez-Valencia et al., because Flórez-Valencia et al. explicitly states the use of said teachings to implement the method taught by Flórez-Valencia et al. and thus through such incorporation it would provide a means of rendering said method operable.

7. In regard to claim 2 Flórez-Valencia et al. teaches creating the deformable model with 2-simplex meshes (p. 3, ¶ 5) and mapping the 3D deformable tubular mesh model onto the 3D surface of the tubular object of interest (p. 3, ¶ 3; p. 6, ¶ 1). However, Flórez-Valencia et al. fails to explicitly teach wherein the object of interest is represented in a gray level 3D image. It is implicitly taught by Flórez-Valencia et al. that color is used because both a given object of interest and a mesh are made visually apparent and are not invisible (Figs. 3, 4).

At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to color the object of interest in gray because Applicant has not disclosed that coloring the object of interest in gray provides an advantage, is used for a particular purpose, or solves a stated problem. One of

ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either the color used by Flórez-Valencia et al. or the claimed gray coloring because both colors perform the same function of visually identifying for a given user a given region for further processing. Therefore, it would have been an obvious matter of design choice to modify Flórez-Valencia et al. to obtain the invention as specified in claim 2.

8. In regard to claim 3 Flórez-Valencia et al. teaches computing a 3D path that corresponds to the centerline of a tubular object of interest to segment and defining segments on said 3D path (p. 2, ¶ 4; Fig. 2). Flórez-Valencia et al. teaches an example in which the length, along the longitudinal axis, of an initial straight deformable cylindrical mesh model is equal to the (centerline for a portion of a 3D vessel for the application of a stent) 3D path (p. 3, ¶ 2). Flórez-Valencia et al. teaches dividing the initial mesh into segments of length (e.g., Fig. 4, left) related to (corresponding to locations of) the different segments of the 3D path (Fig. 3; Fig. 4, middle and right). It is noted the respective claim language is silent as to how said relation is defined. Flórez-Valencia et al. teaches computing, for each segment of the mesh, a rigid-body transformation ("...one expects cylindrical structures with a high bending capability but for which deformations should preserve the generalized cylinder shape..." – p. 4, ¶ 2) that transforms the initial direction of the mesh into the direction of the related segment of the 3D path, and applying this transformation to the vertices of the mesh corresponding to that segment (p. 3, ¶ 3; pp. 4-5, § 3.2; p. 6, ¶ 1; Fig. 5). The rationale

disclosed in the rejection of claim 1 is incorporated herein (Montagnat et al. – pp. 1043-1044, § 3.1; pp. 1044-1046, § 5).

9. In regard to claim 6 (avoiding self-intersections; modulating the radius according to the local curvature of the 3D path) the rationale disclosed in the rejection of claim 1 is incorporated herein, specifically Yim et al. – p. 1414, col. 1, ¶ 2; p. 1416, col. 1, ¶ 3; p. 1419, col. 2, ¶ 3; Fig. 4. It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the respective teachings of said papers into the method taught by Flórez-Valencia et al., because Flórez-Valencia et al. explicitly states the use of said teachings to implement the method taught by Flórez-Valencia et al. and thus through such incorporation it would provide a means of rendering said method operable. In addition, by warping radial lines self-intersection could be avoided (p. 1414, col. 1, ¶ 2) resulting in a more continuous model.

10. In regard to claim 10 it is implicitly taught that said method is implemented via a system, wherein said system includes a processor (e.g., circuit means) for executing respective computer instructions to perform said method. The rationale disclosed in the rejection of claim 1 is incorporated herein.

11. In regard to claim 11 the rationale disclosed in the rejection of claim 10 is incorporated herein.

12. In regard to claim 12 the rationale disclosed in the rejection of claim 10 is incorporated herein.

13. Claims 4, 5 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flórez-Valencia et al. (3D Graphical Models for Vascular-Stent Pose Simulation),

Hernández-Hoyos et al. (Computer-assisted Analysis of Three-Dimensional MR Angiograms), Montagnat et al. (A Hybrid Framework for Surface Registration and Deformable Models) and Yim et al. (Vessel Surface Reconstruction With a Tubular Deformable Model)., as applied to claims1-3, 6 and 10-12, in view of Williams et al. (Rational Discrete Generalized Cylinders and their Application to Shape Recovery in Medical Images).

14. In regard to claim 4 Flórez-Valencia et al. fails to teach wherein said rigid-body transformations are blended (linearly interpolated) in between two consecutive segments. Williams et al. teaches the use of interpolation between two consecutive segments (e.g., cross sections) in a rational discrete generalized cylinder (pp. 389-390, § 4; p. 390, § 5.1, p. 391, § 6; Fig. 4). It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the teachings of Williams et al. into the method taught by Flórez-Valencia et al., because through such incorporation it would provide a means of minimizing distortion (e.g., twist) of said cylinder resulting in a more continuous model.

15. In regard to claim 5 Flórez-Valencia et al. fails to teach wherein a linear interpolation is used between two rotations (family of rotations). Williams et al. teaches wherein a linear interpolation is used between a family of rotations (pp. 390-391, § 5.2; p. 391, § 6; Fig. 4). The rationale disclosed in the rejection of claim 4 is incorporated herein.

16. In regard to claim 7 Flórez-Valencia et al. fails to teach applying the radius modulation technique via linear blending (linear interpolation) from one radius (segment)

to the other. Williams et al. teaches the use of interpolation between two consecutive segments (e.g., cross sections) in a rational discrete generalized cylinder (pp. 389-390, § 4; p. 390, § 5.1, p. 391, § 6; Fig. 4). It is noted that each section of said cylinder defined by a respective radius is considered to read on a segment. It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the teachings of Williams et al. into the method taught by Flórez-Valencia et al., because through such incorporation it would provide a means of minimizing distortion (e.g., twist) of said cylinder resulting in a more continuous model.

17. In regard to claim 8 Flórez-Valencia et al. teaches that "...one expects cylindrical structures with a high bending capability but for which deformations should preserve the generalized cylinder shape..." (p. 4, ¶ 2). However, Flórez-Valencia et al. fails to explicitly teach computing the minimal 3D rotation from the initial mesh direction to a target segment. Williams et al. teaches computing the minimal 3D rotation from the initial mesh direction to a target segment (pp. 389-390, § 4; p. 390, § 5.1, 5.2, p. 391, § 6; Fig. 4). It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the teachings of Williams et al. into the method taught by Flórez-Valencia et al., because through such incorporation it would provide a means of minimizing distortion (e.g., twist) of said cylinder resulting in a more continuous model.

18. In regard to claim 9 Flórez-Valencia et al. fails to explicitly teach defining rotations between segments with an axis parameter and with a rotation angle parameter and computing these parameters iteratively from one segment to the other so that the

new rotation for a current segment is computed as a composition of the found rotation for the previous segment and the minimal rotation from the previous and the current segment. The rationale disclosed in the rejection of claim 8 is incorporated herein, specifically Williams et al. – pp. 389-390, § 4; p. 390, § 5.1, 5.2, p. 391, § 6; Fig. 4. It is noted that the iterative processing of a family of rotations, as disclosed by Williams et al., implicitly teaches that a rotation performed after a previous rotation in said family of rotations will be, at least to some degree, dependent upon the previous rotation.

Conclusion

The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure: Alexa (Linear Combination and Transformations).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter-Anthony Pappas whose telephone number is 571-272-7646. The examiner can normally be reached on M-F 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on 571-272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Peter-Anthony Pappas
Examiner
Art Unit 2628

PP